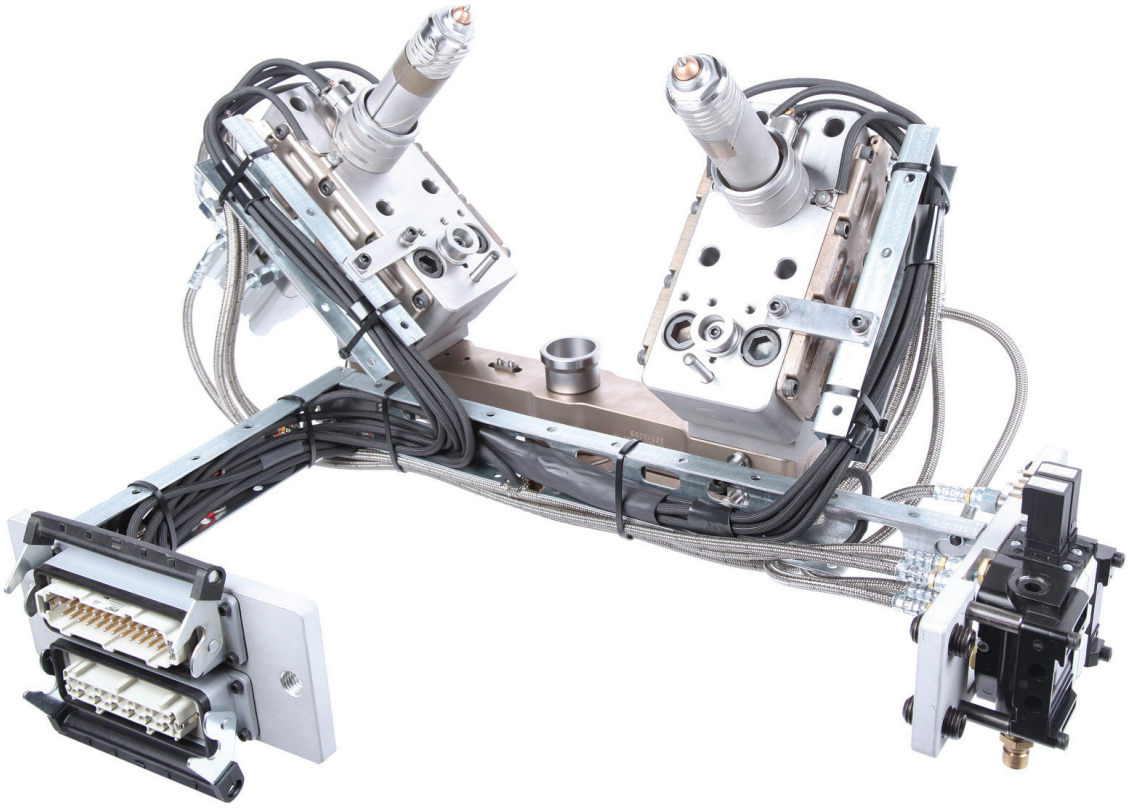
Vision

USER MANUAL



Mold Masters®
performance delivered

Table of Contents

Section 1 - Introduction 1-1

Key Features 1-1
Typical Applications 1-1
Key Benefits 1-1
Introduction 1-3
Warranty and Documentation 1-3
Release Details 1-3
Trademarks and Patents 1-4

Section 2 - Global Support 2-1

Manufacturing Facilities 2-1
Regional Offices 2-1
International Representatives 2-2

Section 3 - Safety 3-1

Notices 3-1
General Safety Warnings 3-1
Operating the Mold 3-2
Heater Element 3-2

Section 4 - Preparation 4-1

Introduction 4-1
Screw Lengths 4-1
Tools Required 4-1
Unpacking the System 4-1
Cleaning 4-1

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Section 5 - Assembly 5-1

Introduction 5-1
Typical Vision System 5-1
Pre-Assembly Checks of Gate Seals & Nozzle 5-2
Assembly of Gate Seals to Nozzle 5-2
Nozzle Thermocouple Installation 5-3
Sub-Manifold Assembly 5-4
Bridge Assembly 5-9
Installing Heater Plate Thermocouple 5-9
Installation of Inlet Components 5-10
Sub-Manifold Wiring 5-14
Plumbing Cylinders 5-15
Bridge Wiring 5-15

Section 6 - Electrical Testing 6-1

Introduction 6-1
Wiring Check 6-1
Thermocouple Continuity Test 6-1
Pinch Point Test 6-2
Heater Continuity 6-2
Thermocouple Wiring Guidelines 6-2
Heating Test with a Temperature Controller 6-2

Section 7 - System Installation 7-1

Introduction 7-1
Prior to Assembly 7-1
System installation 7-1

Section 8 - System Start Up & Shut Down.....8-1

Pre-Start-up 8-1
Start-up 8-1

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Section 9 - Maintenance Procedures 9-1

Introduction..... 9-1
Terminal End Removal 9-1
Terminal Assembly..... 9-1
Heater Plate Power Lead Replacement 9-2
Gate Seal Maintenance..... 9-2
Gate Seal Removal 9-2
Checking Nozzle Tip Height 9-4
Replacing Pneumatic Cylinder Seal and Gasket..... 9-4
Nozzle Thermocouple Removal 9-6
Torque Settings..... 9-6

Section 10- Troubleshooting 10-1

Introduction..... 10-1
Moisture Related Issues..... 10-1
Pre-Molding Precautions 10-2
Establishing Root Cause 10-2
Defect types, causes and remedies index..... 10-3
Parts have dark specks 10-4
Parts have blisters and/or bubbles 10-5
Parts have burn marks 10-6
Parts surface has jetting..... 10-7
Parts are short..... 10-8
Parts have sinks or voids..... 10-9
Parts display splay..... 10-10
Parts are streaked 10-11

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Section 1 - Introduction

DROP-IN, CONNECT, GO - THE CLEAR CHOICE FOR LENSES

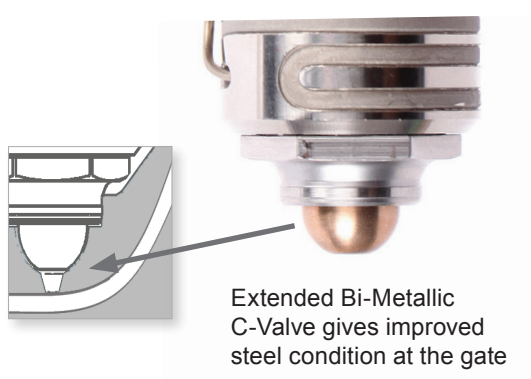
With standard components and drop-in features the Vision system is a clear choice for automotive lens or housing applications. Vision ensures faster delivery time, easy installation, quick start-ups, and user-friendly maintenance.

Key Features

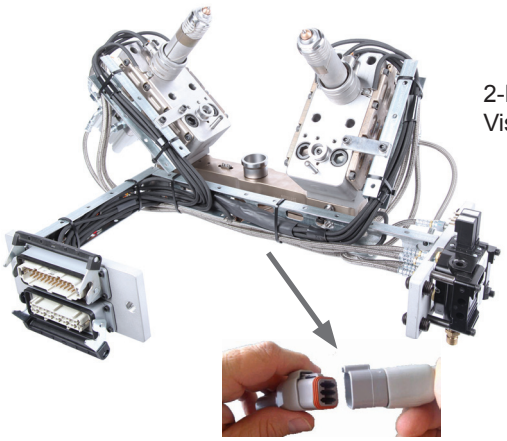
- Specially engineered angled step
- Pre-assembled and pre-wired with drop-in functionality and quick disconnects
- Field replaceable components including heaters
- Quick actuator disassembly to release valve pin
- Optional dual thermocouples
- Optional water cooling nozzle jacket
- Extended Bi-Metallic C-Valve gives improved steel condition at the gate
- Valve pin orientation option available for textured or contoured surfaces

Key Benefits

- Ability to meet a variety of angles for optimal gate locations
- Simplified mold plate machining
- Greater tool integrity due to minimal machining for system interface
- Simplified cooling circuit design requirements
- Quick, easy system maintenance
- Rapid 2D and 3D designs resulting in expedited system delivery
- Reduced installation times



Extended Bi-Metallic C-Valve gives improved steel condition at the gate



2-Drop Vision System

Quick connections between sub-manifold and main bridge

Typical Applications

Headlights

Dipped and main beam Lights

Marker and signal lights

Tail lights

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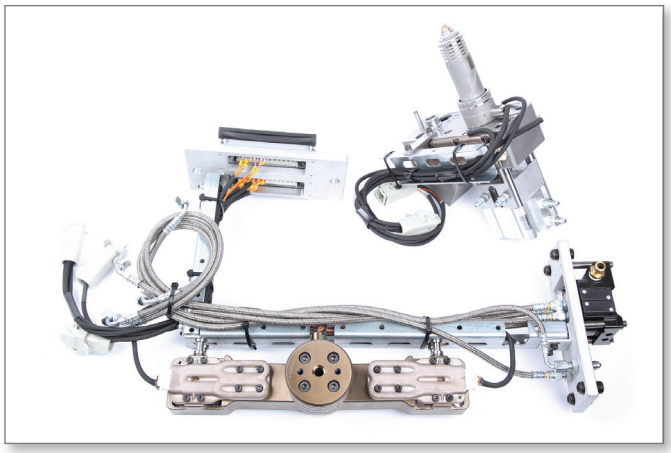
Standard Vision System

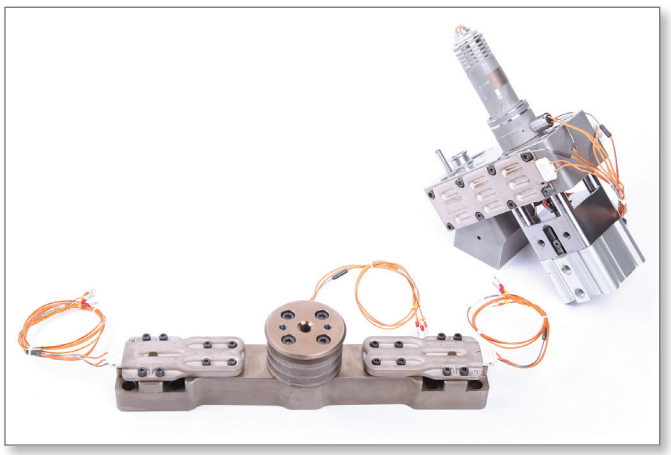
Drop in, Connect & Go



- Pre-wired and plumbed for easy "Drop in, Connect & Go" installation
- Manifold mounted wire armor that protects and routes electrical and thermocouple wires while providing a stable mounting platform for the plumbing
- Integrated electrical panel that houses and protects all electrical connections, including solenoid plugs
- Quick connection between sub-manifold and bridge
- All wire contact pins and required high temperature sheathing installed
- Stainless steel braided plumbing hoses with high temp TFE liner

Vision Lite System

Complete your own wiring and plumbing



- Basic assembled sub-manifold and bridge without pre-wiring or plumbing
- Does not include:
  - Quick connections between sub-manifold and bridge
  - Wire contact pins or high temperature sheathing
  - Wire armor, electrical boxes, mounting plate, plumbing interface, or valve solenoid mounting

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Introduction

We would like to take this opportunity to thank you for purchasing a *Mold-Masters* Vision hot runner.
The purpose of this manual is to assist users in the integration, operation and maintenance of *Mold-Masters* systems. This manual is designed to cover most system configurations. For additional information, please contact your representative or a *Mold-Masters* office.

Please note that the responsibility for the safety of personnel remains exclusively with the employer. It is the obligation of the employer to properly train and instruct its personnel in the safe operation of equipment including maintenance and the purpose and proper use of all the safety devices. In addition, the employer must provide its personnel with all necessary protective clothing, including such items as a face shield and heat resistant gloves. Any instructional material provided by *Mold-Masters* for the operation and maintenance of equipment, does not in any way absolve the employer from fulfilling these obligations and *Mold-Masters* disclaims liability for injury to personnel using equipment supplied.

Warranty and Documentation

Your original system documentation contains warranty details. If for any reason, parts must be returned to *Mold-Masters,* it is essential to obtain prior pre-authorization and a return authorization number.

Documentation will include any or all of the following:

- Parts list containing all system components. Together with the general assembly drawing, the parts list should be referenced when ordering spare parts.
- General assembly drawing used to integrate your hot runner system into mold.
- Hot half drawing used to integrate hot half to cavity plate.

When ordering this manual, please reference document number: **VSUMEN01XX**.

Release Details

Document #	Release Date	Version
VSUMEN01XX	February 2012	01

This manual should be used in conjunction with any appropriate *Mold-Masters* Temperature Controller User Manual.

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Trademarks and Patents

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Section 3 - Safety

High injection pressures and high temperatures are used in the operation of hot runners. To protect the operator in the work place, ensure that all safety devices are installed on the machine.

- Be aware of all warning labels attached to the mold and machine.
- Refer to the machine user manual for safety procedures and checks not included here in the hot runner specific manual.

Notices

To make the manual easier to use, we've included notices throughout that highlight important information. See below.

WARNING
A safety warning indicates a potentially hazardous situation, which if not avoided, could result in serious injury or death.

CAUTION
A caution indicates that damage to equipment is possible if the instruction is not followed.

NOTE
A note indicates useful additional information or is used as a reminder of important information.

General Safety Warnings

The equipment supplied is subjected to high injection pressures and high temperatures.
Ensure that extreme caution is observed in the operation and maintenance of the hot runner system and the injection molding machines.

- Do not operate the equipment with unconfined long hair, loose clothing or jewelry, including name badges, neckties, etc. These may get caught by the moving belt mechanism and can cause death or serious injury.
- Never disable or bypass a safety device.
- It is highly recommended that all operators wear face shields and use heat resistant gloves when working around the feed throat, purging the machine or cleaning the gates of the mold.
- Check frequently for possible oil leaks/water leaks. Stop the machine and make repairs.
- Remove purgings from the machine immediately.
- Never touch or inspect the timing belt when power is on and motor and controller are connected. Unplug the controller before any maintenance.
- Always cover belt area with proper protecting sheet before any bench test or in-mold testing.
- High voltage and amperage cables are connected to the controller (220VAC). There is also a high voltage cable connection between servo motor and controller.
- Unplug the controller before performing any maintenance work.

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General Safety Warnings - Con't

- Hoses fitted to the mold will contain high or low temperature fluids or air under high pressure. The operator must shut down and lockout these systems as well as relieving any pressure before performing any work with these hoses.
- Never perform any work on the mold unless the hydraulic pump has been stopped.
- High voltage and amperage cables are connected to the mold. Electric power must be shut off prior to installing or removing any cables.
- Water and or hydraulics on the mold may be in close proximity to electrical connections and equipment. Water leakage may cause an electrical short circuit. Hydraulic fluid leakage may cause a fire hazard. Always keep water and /or hydraulic hoses and fittings in good condition to avoid leaks.
- All maintenance on Mold Masters products should be performed by properly trained personnel based on local law or regulation requirements. The electrical products need to be grounded before performing any maintenance to avoid potential risk of electrical shock.

Operating the Mold

Check that all coolant, hydraulic and air lines as well as electrical cables will not interfere with the moving parts of the mold, machine or robot. The lines must be of sufficient length so that they will not strain or pinch when the mold halves separate.

- For water cooling nozzle jacket, coolant must be maintained with the proper mixture to prevent corrosion and circuit blockage.
- Care must be taken to ensure the nozzle terminal ends do not come in contact with the hydraulic fluid. The nozzles may short out or become damaged.
- Do not mix electrical power cables with thermocouple extension cables. They are not designed to carry the power load or list accurate temperature readings in each other's application.

Heater Element

To maximize heater element and component life, the temperature must be controlled and maintained within safe operating limits. *Mold-Masters* strongly recommends individual control of each heated component, including heater plates, with a reliable temperature controller that includes soft-start protection.

All Mold-Masters heated components are manufactured to standards that ensure safe and reliable operation provided that the following precautions are met:

- Always operate the system using correctly installed "J" type thermocouples connected to a reliable temperature controller with "soft-start" protection.
- Avoid running the system for long periods on "manual" control.
- Use caution when applying power in "manual" mode. Use minimum heat required for the process to avoid overheating and possible damage to components.
- Always replace pinched or damaged thermocouples.
- When "grouping" heated components together and controlling more than one load from a single thermocouple, make sure that the components are of similar material, wattage, size and are exposed to the same thermal conditions.
- When replacing heater plates or other heated components always replace with genuine Mold-Masters components of the same type and install as originally specified on Mold-Masters general assembly drawings.

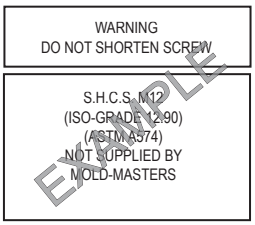
Section 4 - Preparation

Introduction

The following section is a step-by-step guide to preparing your Mold-Masters® system for use.

Screw Lengths

When the manifold is heated the metal expands stretching the mounting screws, if screw lengths are shortened there is a possibility of shearing. Be aware of warnings placed on the assembly drawings.
The expansion factor is calculated into the length of each screw size.



WARNING
The use of an incorrect size, length and grade screw could cause the screw to shear, fatigue or stretch beyond its yield point, resulting in expensive downtime of the hot runner.

Tools Required

Depending on the size and complexity of your hot runner system, you will require most of the tools and materials listed below.

- Allen keys - Set of imperial size keys and metric sizes for use on both imperial and metric cap screws (depending on system).
- Nickel based anti-seize compound - To prevent oxidation of screw threads that could cause screws to seize with high temperatures.
- Solvents (denatured alcohol) - For removal of rust inhibitors.
- Calibrated torque wrench - For consistent screw pressure throughout the system.
- Pliers - For general assembly work.
- Circlip pliers - To remove and install Circlip in valve systems.
- Micrometer - (sizes 0 - 6” and 0 - 150 mm) to check system part and plate thickness.
- Depth micrometer - To check bore depths.
- Slot head screw driver - Used in installing thermocouples and ground wires.
- Slot head screw driver (small) - Used in fastening electrical wires to connectors.
- Crimping tool - For fastening connector pins when necessary.
- Wire strippers - For preparing wires.
- Utility knife - For cutting tape, wires etc.
- Glass tape - Used for grouping wires into zones.
- Bluing Compound - For checking face contact.
- Sockets.
- Lapping compound for valve gate systems.
- Plastic face hammer.
- Retaining ring pliers (for bore diameter bigger than 65mm).
- Removal tool for crimp contacts when necessary.

Unpacking the System

1. Carefully open the shipping crate and inspect contents. Secure loose items and check that the system is received in good condition and no damage occurred during shipment. Remove any documentation or spares packages and set aside.
2. After removing all restraints, attach the crane to the hoist and carefully remove the system from the shipping crate.

   WARNING
   Make sure the lifting eyebolt, lifting chain and crane are rated to adequately support the weight. Failure to do so can cause a serious injury.

   Make sure the machine has been locked out and tagged out in accordance to the machines documented procedures. Failure to do so may lead to serious injury or death.
3. Check that all mold base dimensions are correct and correspond to *Mold-Masters* general assembly drawings.

Cleaning

All nozzles, manifolds and hot runner components must be free of the rust inhibitor applied at the factory.

1. Remove protective covers from all gate seals.
2. Clean all surfaces and dowel holes, ensuring that no debris, burrs, shavings, dust, dirt, or other foreign material which could interfere with measurements, exists. Ream holes out if necessary.
3. Remove tape from inlet and clean.

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Section 5 - Assembly

Introduction

Vision systems are designed as pre-assembled, drop-in systems for easy installation, quick start-ups, and user-friendly maintenance. However, depending on the type of system ordered, some systems may be supplied minus certain optional components or features. Please reference your GA drawing for details on the system ordered.

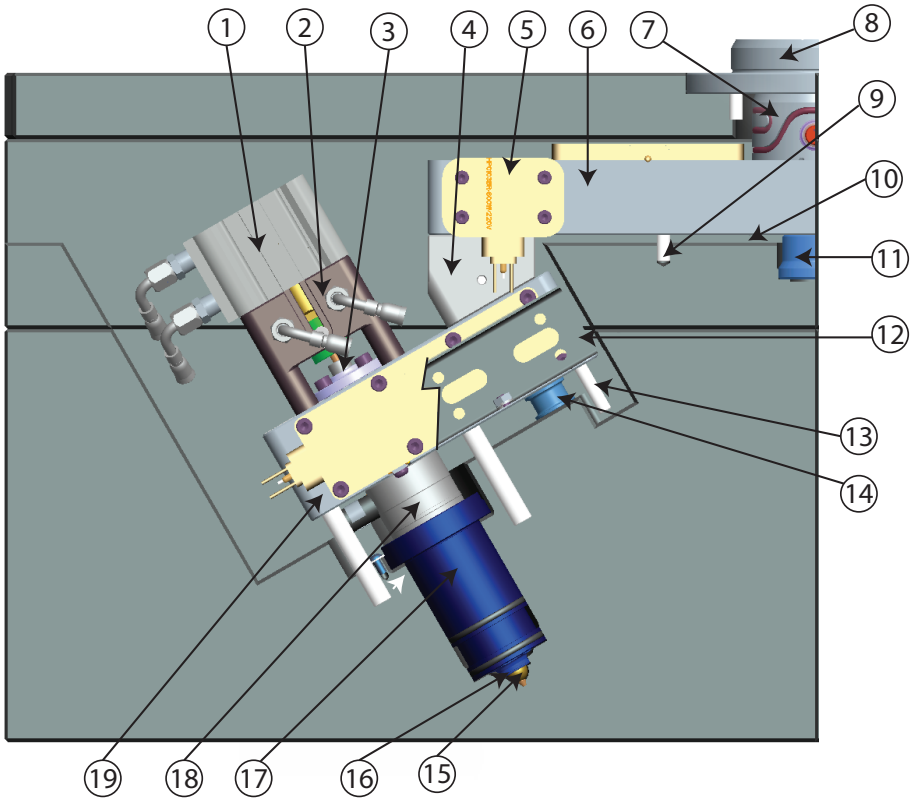
The following detailed assembly instructions are largely for reference purposes. The wiring and plumbing instructions at the end of the section will be helpful for those systems ordered without the pre-wired and pre-plumbed feature.

See ***Section 7 - System Installation*** for instructions on installing your Vision hot runner into an existing manifold plate system or spacer block system.

Optional Components / Features
• Optional dual thermocouples
• Optional water cooling nozzle jacket

Typical Vision System

An example Vision system is provided below to illustrate the various components.



1 valve actuator
2 actuator cooling
3 valve nut & insert
4 wedge
5 heater plate
6 bridge
7 inlet
8 locating ring
9 bridge anti-rotation
10 air gap
11 bridge locator
12 wire armor (option)
13 sub-manifold anti-rotation
14 support bushing
15 gate liner
16 gate seal
17 water cooling nozzle jacket (option)
18 nozzle
19 sub-manifold

Figure 5-1

Pre-Assembly Checks of Gate Seals & Nozzle

1. Blue off the gate seal (and liner if relevant) to ensure a proper contact on sealing surface.

Figure 5-2

2. Torque the gate seal to specified value.

Figure 5-3

3. Remove gate seal and verify transfer of die blue from gate to the liner.
   Verify transfer of die blue to nozzle.
   If not 100% blue on the face, contact your *Mold Masters* representative.

Figure 5-4

4. Clean die blue from components.

Assembly of Gate Seals to Nozzle

1. Apply anti-seize paste to all threaded interfaces.

Figure 5-5

2. Ensure all sealing surfaces are clean and dry.
3. Install gate seal and liner.

Figure 5-6

4. Torque to specified values.

Figure 5-7

Nozzle Thermocouple Installation

1. Clean the nozzle thermocouple bore.
   For 1.5 mm thermocouples we suggest using a 1/16 inch drill in a pin vise.

Figure 5-8

2. Insert the thermocouple through the flange bore.

Figure 5-9

3. Manually bend the thermocouple tip against your thumb to approximately a 90° angle, ensuring bend length is sufficient to reach the bottom of the thermocouple bore.

Figure 5-10

4. Dress thermocouple carefully alongside nozzle body and install retaining clip(s). Check parts list for recommended number of clips for the nozzle type. Check that the thermocouple fits into the recess of the clip. It is important that one retainer clip is at the top of the nozzle to keep the thermocouple inside the bore. This is especially important when thermocouples are assembled from the front.

Figure 5-11

5. Install the terminal end retaining clip. Check that the thermocouple is seated in the recess of the terminal end clip.

Figure 5-12

CAUTION
Ensure the terminal end of the thermocouple stays fully engaged in the slot while bending the thermocouple at the nozzle flange area.

6. Use heat resistant tape to secure the nozzle wires and thermocouple wires just above or below the insulator pod.

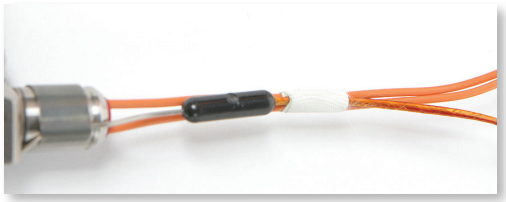


Figure 5-13

Sub-Manifold Assembly

Install Wedge

1. Install wedge anti-rotation dowel pin into sub-manifold.

Figure 5-14

2. Blue top and bottom faces of inlet seal.
3. Insert inlet seal into sub-manifold inlet bore.

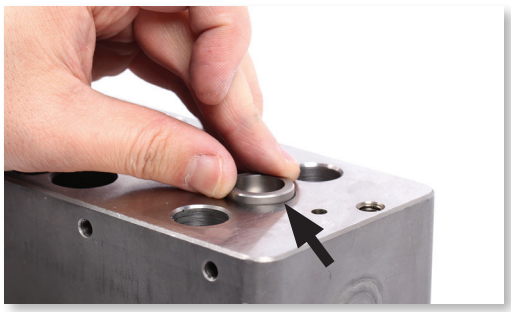


Figure 5-15

4. Apply anti-seize to the SHCS (M16) and install from sub-manifold to wedge and torque to check fit.

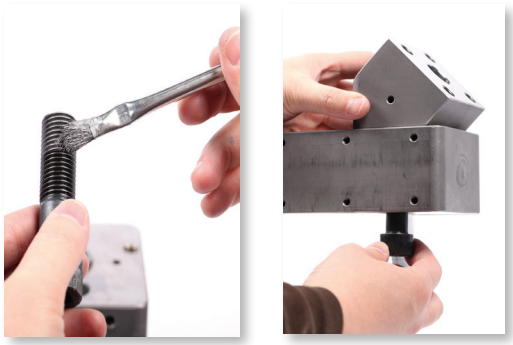


Figure 5-16

NOTE
Use 1/3 of specified torque value for bluing.

5. Remove screws and verify blue on top and bottom surfaces of the inlet seal.
6. Clean bluing from all components, install screws and torque to specified value.
7. Blue top and bottom faces of wedge inlet seal.

Figure 5-17

8. Insert inlet seal into wedge inlet bore.

Figure 5-18

9. Apply anti-seize to SHCS (M12) and install to bridge.
10. Remove screws and inlet seal and verify blue on all surfaces.
11. Clean bluing from all components and keep for system installation.

NOTE
Bridge and wedge mounting screws should be torqued 1/3 higher than specified on GA drawings.

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Install Valve Nut, Insert and Nozzle Assembly

1. Blue valve insert, valve nut and nozzle inlet seal.

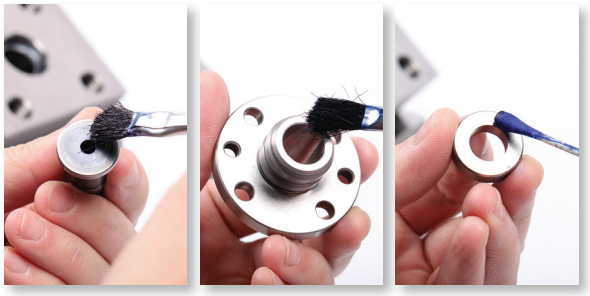

Figure 5-19

2. Install valve insert into valve nut.

Figure 5-20

3. Install inlet seal in nozzle side of sub-manifold and valve nut/valve insert into other side of sub-manifold.

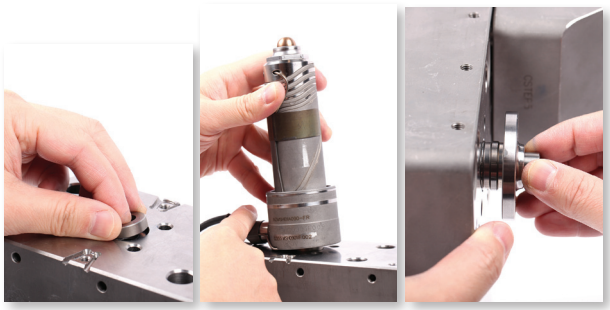

Figure 5-21

4. Apply anti-seize to SHCS.
5. Install SHCS in a crossing pattern to nozzle through the manifold.

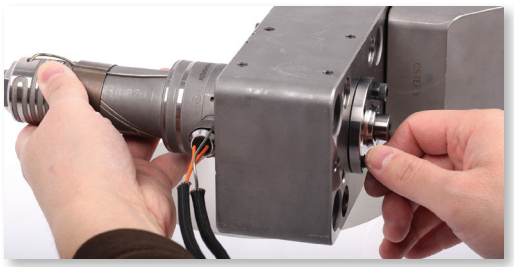

Figure 5-22

6. Remove valve nut, insert and inlet seal and verify blue on all surfaces.
7. Clean bluing from all components.
8. Install and torque in crossing pattern as follows: hand tighten, 1/3 torque, 2/3 torque, then full torque.

Figure 5-23

9. Install valve pin to verify fit.

Figure 5-24

NOTE
Ensure nozzle terminal end is in the direction noted on the GA drawing.

Figure 5-25

Install Support Bushing

1. Apply anti-seize to SHCS.
2. Install support bushing to sub-manifold and torque SHCS to specified value.

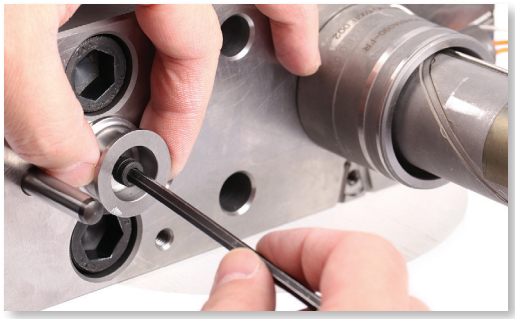

Figure 5-26

Install Sub-Manifold Anti-Rotation Dowel Pin

1. Install anti-rotation dowel pin into manifold until it bottoms out.

Figure 5-27

Install Pnuematic Cylinder

1. Apply teflon tape and install pneumatic fittings to the pneumatic cylinder cooling plate.

Figure 5-28

2. Apply die blue to the pneumatic cylinder cooling plate legs and check die blue has tranferred to sub-manifold.

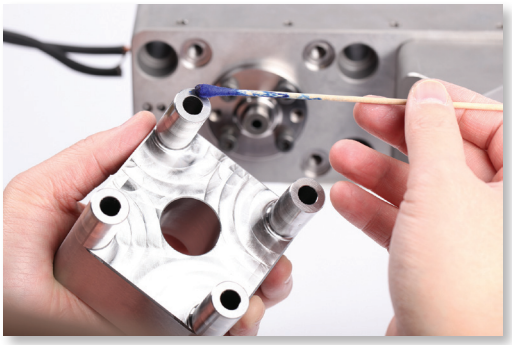

Figure 5-29

3. Install pneumatic cylinder cooling plate to sub-manifold.

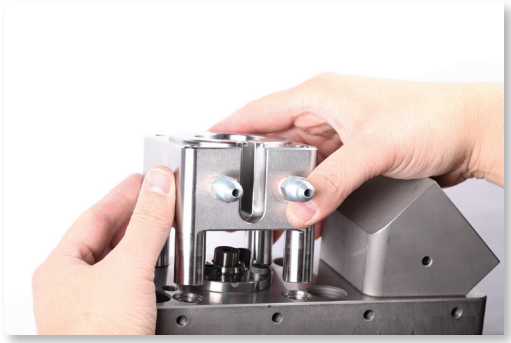

Figure 5-30

4. Apply Loctite (Locktite 2422 recommended) to VPHOLDER17 and install into cylinder piston rod.

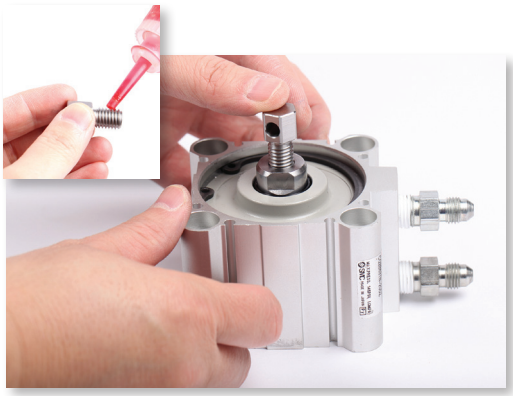

Figure 5-31

5. Place valve pin into VPHOLDER18 pocket.

Figure 5-32

6. Apply Loctite (Locktite 2422 recommended) to shoulder bolt SHSS (M6).

Figure 5-33

7. Insert VPHOLDER18 into VPHOLDER17, then thread shoulder bolt to lock together.

Figure 5-34

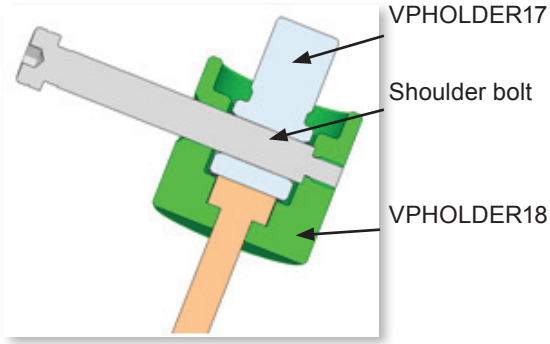

Figure 5-35

8. Drop the cylinder assembly onto the cooling plate, making sure the shoulder bolt aligns to the side slot on the cooling plate.

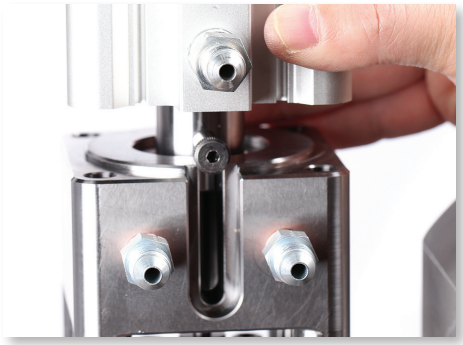

Figure 5-36

9. Check to make sure the valve pin can freely move up and down.

Figure 5-37

10. Apply Loctite (Locktite 2422 recommended) to the SHCS (M8).
11. Bolt and torque screws in a cross pattern gradually increasing torque to specified value.

Figure 5-38

Install Sub-Manifold Heater Plates

1. Apply anti-seize to the SHCS (M6).
2. Bolt and torque screws in a cross pattern gradually increasing torque to specified value.

Figure 5-39

Install Sub-Manifold Thermocouple

CAUTION

This is a pinch point area. Use caution when installing. Failure to do so could result in damage to the thermocouple.

1. Clean the thermocouple bore.
2. Although not necessary, a thermal compound may be applied to the thermocouple tip to ensure a good contact.
3. Insert the thermocouple into either one of the two bores. Check that the thermocouple is touching the bottom of the hole.

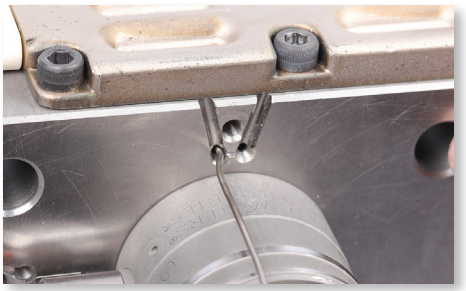

Figure 5-40

4. Press down on the thermocouple and gently bend the thermocouple through 90°.
5. Check that the thermocouple sits in the sub-manifold cutout.

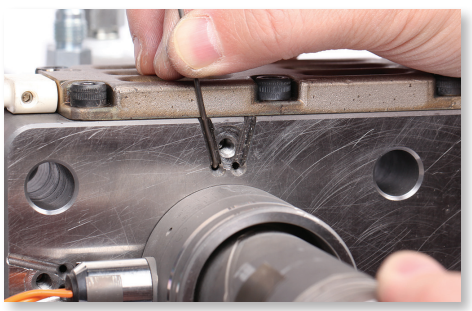

Figure 5-41

6. Apply anti-seize to the screw and install the thermocouple washer and screw.

Figure 5-42

7. Label the zone number on each wire and thermocouple.
8. Tape wires for each zone together.

Install Sub-Manifold Wire Armor

1. Apply anti-seize to SHCS (M6).

Figure 5-43

2. Install mounting tab to wire armor with SHCS, lockwasher and nut.

Figure 5-44

3. Apply anti-seize to second SHCS (M6).
4. Install wire armor to the sub-manifold.

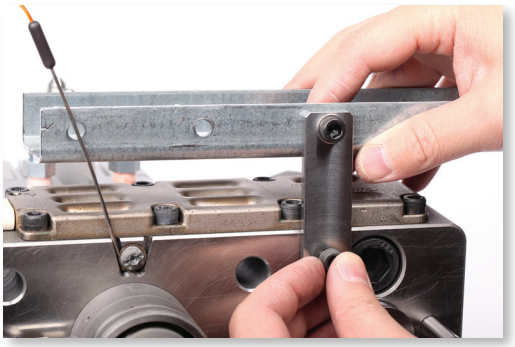

Figure 5-45

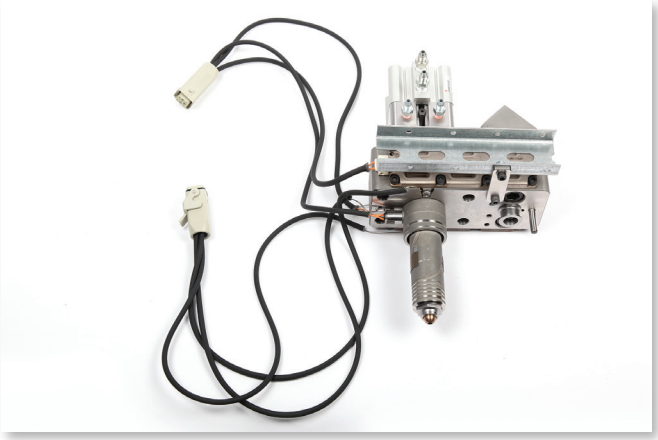

Figure 5-46 Finsihed sub-manifold assembly

Bridge Assembly

Installing Heater Plate Thermocouple

These procedures apply to systems with external heater plates. Refer to the general assembly drawing to determine which heater plate applies to your system.

NOTE
Heater plates on the sub-manifold use controlling thermocouples in the manifold. Installation of the thermocouple in the heater plate is only required for heater plates on the main manifold (bridge).

NOTE
Current bronze heater plates are directly interchangeable with previous copper or aluminum based plates that may exist on your *Mold-Masters* system. However, when multiple heater plates are controlled by one thermocouple, these heater plates must be made of the same material, of equal voltage and located in similar thermal environments.

1. Insert the thermocouple into the bore. Ensure the thermocouple is touching the bottom of the bore hole.
2. Press down on the thermocouple and gently bend to 90°.

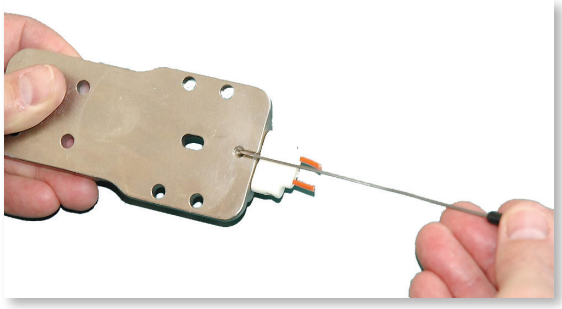

Figure 5-47

Install Heater Plates

1. Install the heater plate to the manifold. Refer to the general assembly drawing for location.
2. Use anti-seize on threads. Bolt and torque screws in a cross pattern gradually increasing torque to specified value.

CAUTION
This is a pinch point area. Use caution when installing the heater plate to the manifold plate. Failure to do so could result in damage to the thermocouple.

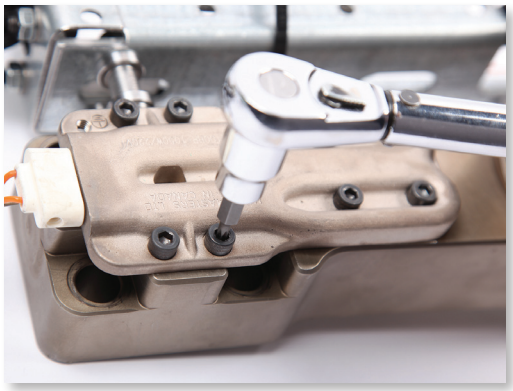

Figure 5-48

CAUTION
Do not over-tighten the mounting screws. This could result in the heater plate losing contact with the manifold plate. Refer to the general assembly drawing for the correct torque values. It is recommended that the heater plate wires be isolated and grouped so that they do not have to be disconnected if the manifold needs to be dismantled for repair.

3. The heater plates are supplied with the power wires connected. Place a zone number on each wire and thermocouple.

Install Step

(If using step instead of wedge)

1. Blue bottom of step.

Figure 5-49

2. Apply anti-seize to SHCS and install step to sub-manifold.

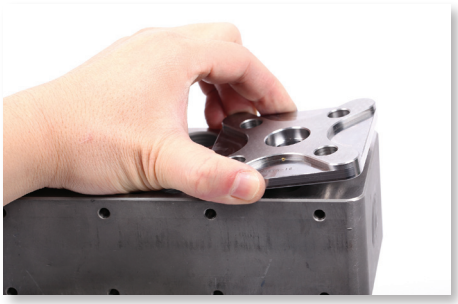

Figure 5-50

3. Torque screws in a crossing pattern gradually increasing torque to specified value.
4. Remove step to verify blued surfaces.
5. Clean blue from all components.
6. Re-install step.
7. Torque screws in a crossing pattern gradually increasing torque to specified value.

NOTE

Bridge and wedge mounting screws should be torqued 1/3 higher than specified on GA drawings.

Use 1/3 of specified torque value for bluing.

Installation of Inlet Components

The following procedures refer to different system configurations. Refer to your parts list and general assembly drawings to determine your system type.

CAUTION

For all inlet components it is important that the mold locating ring is touching the inlet component just enough for sealing the area. This should be double checked with the system drawings.

NOTE

The machine nozzle bore should be no smaller than 1.0mm (0.040”) smaller than the back plate bore and no larger than the back plate bore.

Heated Back Plate Installation

The center heater may require the machine nozzle radius to be added.

1. Check the machine nozzle radius.
2. Check the seating on the bottom face of the back plate and manifold using bluing compound.

Figure 5-51

3. Clean bluing off all components.
4. Place the center heater on the manifold.
5. Rotate the center heater to align with the tapped holes in the manifold and align terminals with cut out.
6. Install mounting screws through the center heater into the tapped holes of the manifold. Use anti-seize on the screws.

Figure 5-52

7. Torque screws to values indicated on the general assembly drawing.

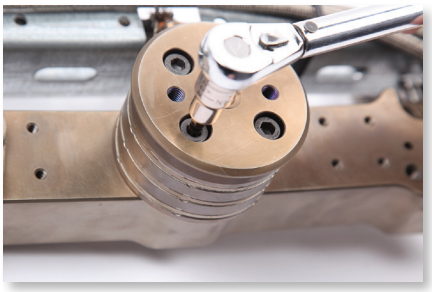

Figure 5-53

8. Place zone number on each wire and thermocouple.
9. Tape wires for each zone together.
10. Install the wires into the wire channels and secure with high temperature cable ties.
11. Feed wires back through the wire channel in the mold base to the electrical box.

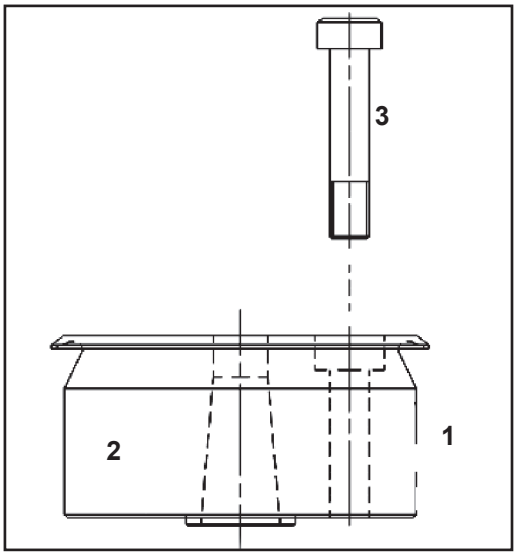

Figure 5-54 Back Plate (Heated)
1. Thermocouple 2. Center Heater 3. Screw

Inlet Extension Installation

1. Check the machine nozzle radius.
2. Check the seating on the bottom face of the back plate and manifold using bluing compound.
3. Clean bluing off all components.
4. Place the inlet extension on the manifold.
5. Install mounting screws through the nozzle flange and into the manifold.
6. Torque screws to manifold using anti-seize on threads.
7. Place a zone number on each wire and thermocouple.
8. Tape wires for each zone together.
9. Install the wires into the wire channels and secure with wire retainers. Feed the wires back through the wire channel in the mold base to the electrical box.

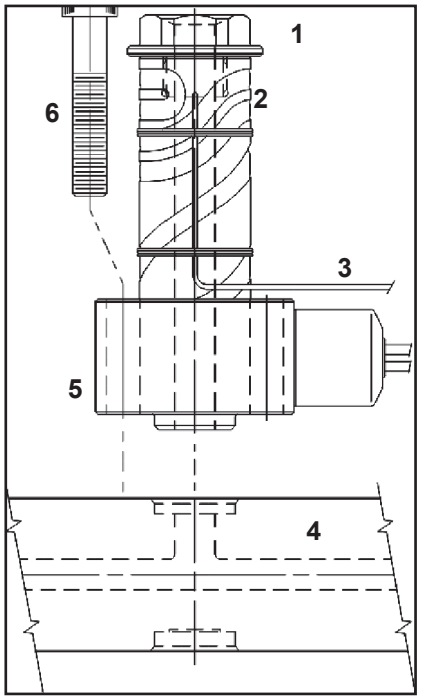

Figure 5-55 Inlet Extension
1. Extension Tip 2. Inlet Extension
3. Thermocouple 4. Manifold
5. Flange 6. Screw

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Inlet Extension with Heater Sleeves

1. Apply die blue to bottom of inlet.

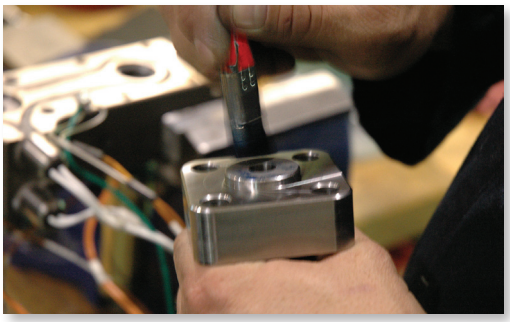

Figure 5-56

2. Apply anti-seize to SHCS and install inlet to manifold.

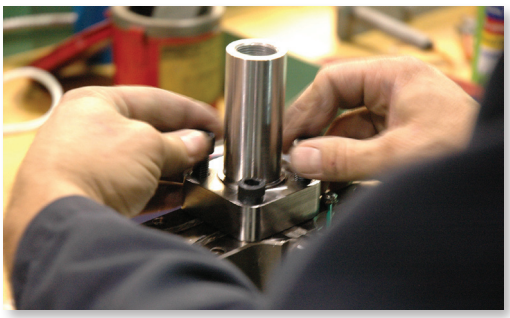

Figure 5-57

3. Torque screws in a crossing pattern gradually increasing torque to specified value.

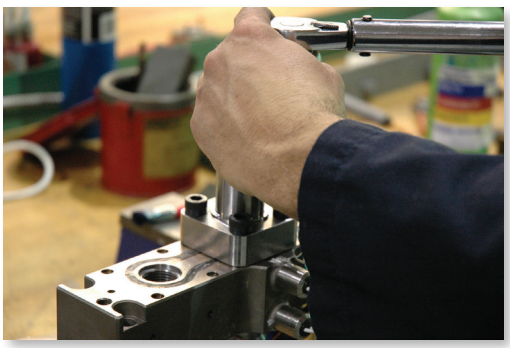

Figure 5-58

4. Remove inlet to verify blued surfaces.

5. Clean the die blue from the inlet and manifold.

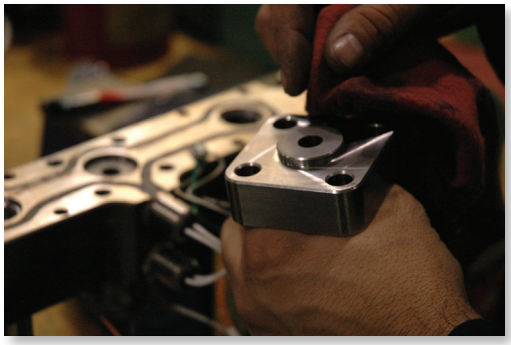

Figure 5-59

6. Re-install inlet. Torque screws in a crossing pattern gradually increasing torque to specified value.

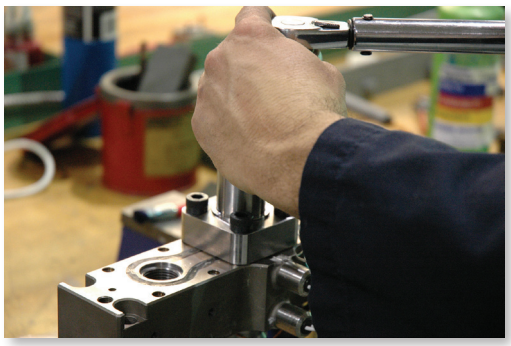

Figure 5-60

7. Blue the inlet seal and verify blued surfaces to check fit of seal in the inlet.

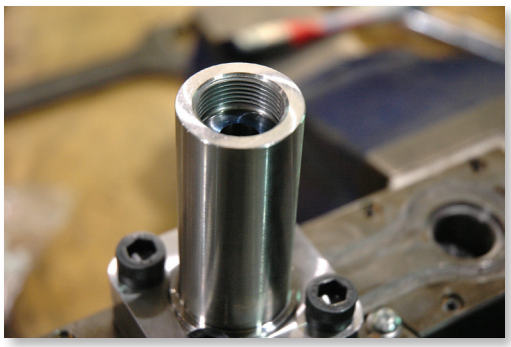

Figure 5-61

8. Clean blue from inlet seal and inlet.

Figure 5-62

9. Install inlet heaters and sleeves per specified drawing.

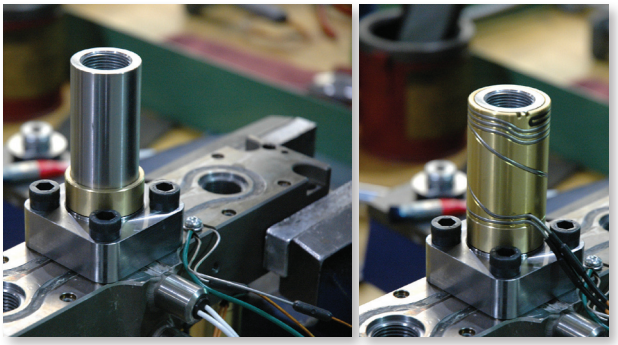

Figure 5-63

10. Apply anti-seize to threads and install inlet seal to inlet.

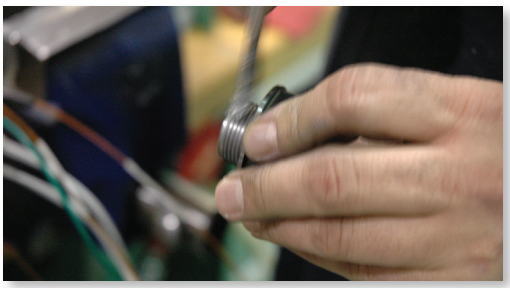

Figure 5-64

11. Torque to specified value.

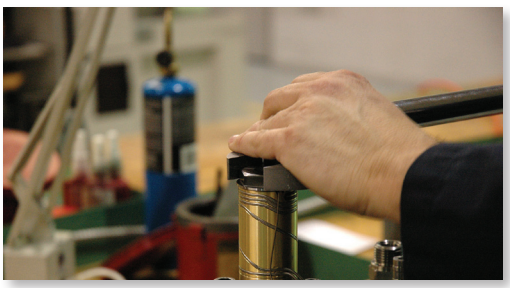

Figure 5-65

12. Install thermocouple into slot until bottoms out.

Figure 5-66

13. Bend 180 degrees.

Figure 5-67

14. Install thermocouple clip.

Figure 5-68

Install Bridge Wire Armor

1. Apply anti-seize to button head cap screws (BHCS).
2. Install BHCS screws through appropriate slot in wire armor.
3. Add spacer.
4. Install wire armor assembly to manifold.

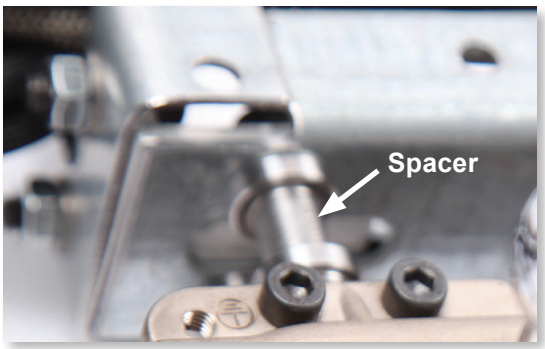

Figure 5-69

Sub-Manifold Wiring

CAUTION
All wires close to a heat source require high temperature sheathing.

Power Wiring

1. Run all the power wires to the bridge and locate a position for quick connector sitting, cut the wires to a proper length.
2. Label the wires and install high temperature sheathing.
3. Crimp all heater plates and nozzle power wires with female contacts.
4. Insert the power wires contacts into the male plug of quick connector ‘1P’ per wiring schematic in GA.
5. Insert the coding pin to the male plug as per wiring schematic if applicable.
6. Get six spare wires crimped with male contacts in one end, insert into the female plug of quick connect ‘1P’, label the wires according to the male side.
7. Snap ‘1P’ plugs together. Run the open end of the wires to the electrical plugs. Cut the wires to the proper length and crimp them. Install high temperature sheathing if needed.
8. Install the power wires into electric plugs per wiring schematic in the GA drawing.
9. Repeat above for each zone. Name connector number according to drop number. Be sure to locate the connectors inside the wire armor.

Thermocouple Wiring

1. Run all the thermocouple wires to the bridge wire armor and locate a position for quick connector sitting, cut the wires to a proper length.
2. Label the wires and install high temperature sheathing.
3. Crimp all thermocouple wires with male contacts.
4. Insert the thermocouple wire contacts into the female plug of quick connector ‘1T’ per wiring schematic in GA.
5. Get six spare wires crimped with female contacts in one end, insert into the male plug of quick connect ‘1T’, label the wires accordingly to the female side.
6. Insert the coding pin to the male plug as per wiring schematic, if applicable.
7. Snap ‘1T’ plugs together, run the open end of the wires to the electrical plugs, cut the wires to the proper length and crimp them, install high temperature sheathing if needed.
8. Install all the thermocouple wires into electric plugs per wiring schematic drawing in the GA.
9. Repeat above for each zone. Name connector number according to drop number. Be sure to locate the connectors inside the wire armor.

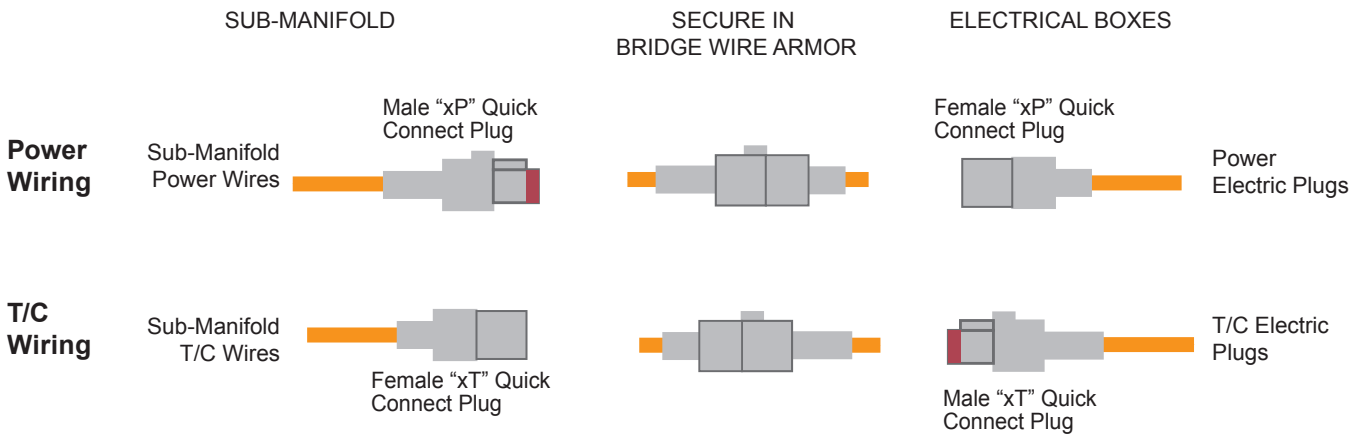

Figure 5-70

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Preparing to Wire the Bridge

CAUTION
All wires close to a heat source require high temperature sheathing.

1. Group thermocouple and heater wires for a single zone together and install high temperature wire sheathing.
2. Label all heater and thermcouple zones.
3. Use heat resistant tape to group thermocouple heater zones together and to avoid losing labels.
4. Repeat for all zones.

Bridge Wiring

1. Run the wires through the wire armor to the electrical plugs.
2. Install the thermocouple and heater wires into electrical plugs per wiring schematic in GA drawings.

Electrical Box

1. Install plugs into electrical box.

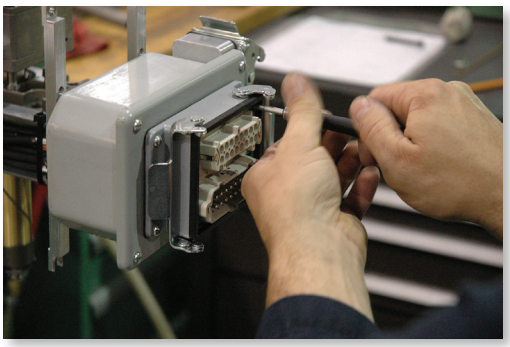

Figure 5-71

Solenoid Valve Wiring

1. Install solenoid coil wires into electrical plugs per wiring schematic in GA drawings.

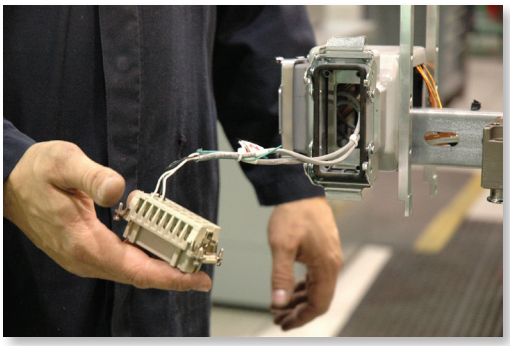

Figure 5-72

2. Install plugs into electrical box.

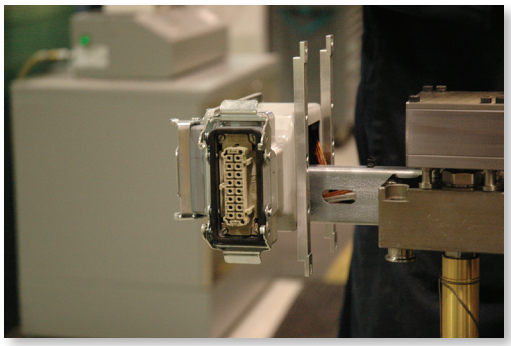

Figure 5-73

Plumbing Cylinders

1. Install hoses per schematic in GA drawings.

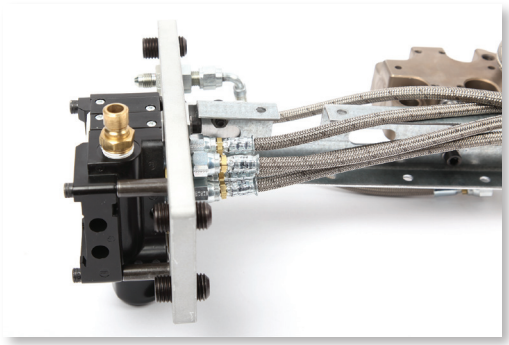

Figure 5-74

3. Tie plumbing on top of the wire channel using high temperature cable ties.

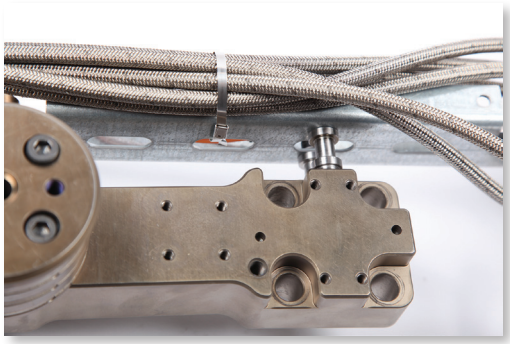

Figure 5-75

Section 6 - Electrical Testing

Introduction

This section contains electrical test procedures for your Mold-Masters Vision system.

WARNING

To avoid serious burns wear safety clothing consisting of a protective heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses. Use adequate ventilation for fumes.
Contact with heated components may cause serious burns. Use a sign in a visible location indicating “Danger: Do Not Touch”.

Before performing any electrical work. Check that the hot runner is suitably grounded.

Turn off the temperature controller and disconnect all electrical wires leading from the mold.
Failure to do so could result in a serious injury or death.

Wiring Check

NOTE

Ensure that a qualified electrician performs all wiring.

1. Check that each wire and thermocouple has a zone number.
2. Check that wires are organized and taped together by zone and plug.
3. Check all wires are secured in wire channels..
4. Connect all power leads and thermocouple wires to mold plugs.
5. The electricity mains should only be connected to the injection mold when all electrical connections are grounded and the mold is closed.

WARNING

A disassembled nozzle should only be connected to an electrical supply when the nozzle has been grounded or a safety isolating transformer is used.

Ground Shorts Test

1. Use an ohm meter to check for continuity between the Mold Power Connector ground pin (metal tabs on side) and the manifold steel. The ohm reading should be zero.
2. Measure the resistance between each pin of the Mold Power Connector (See Figure 6-1) and ground (mold base). The reading should be ∞ (infinity). Occasionally, the electric heaters accumulate moisture, which can reduce the resistance value to between 100 KΩ to 10 MΩ. The controller should be designed to remove this moisture during start-up. Never apply full power to a heater if the insulation resistance reading is below 300 KΩ. Heater resistance above 500 KΩ is acceptable. Also check this if the mold has not been in use for a number of weeks/months.
3. If necessary, remove excess moisture before placing the heater under full current.

Thermocouple Continuity Test

1. Measure the resistance between each pair of thermocouple wires on the mold’s Thermocouple Connector. (See Figure 6-1). The resistance should be between 2.5 Ω and 25 Ω.

Figure 6-1 Mold Plug
1. Mold Power Connector
2. Thermocouple Connector

2. To verify alignment of thermocouple to heater, turn ON one zone at a time & check that the temperature responds accordingly when the set temperature is adjusted.

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Pinch Point Test

1. If there is a suspected pinch point on the thermocouple, remove the thermocouple from the hot runner.
2. Connect a controller to read the temperature.
3. Immerse the sheath of the thermocouple in boiling water at the point that the thermocouple reads the temperature.
4. A good thermocouple will show a temperature rise as soon as the tip of the thermocouple is immersed in water. If there is a pinch point in the thermocouple there will be no change in the reading until the pinch point on the thermocouple is immersed in water.

Heater Continuity

Measure the resistance between each pair of heater power wires at the Mold Power Connector. Compare your reading with your general assembly drawing, where: R = resistance V = voltage P = power

$$R = \frac{V^2}{P}$$

Thermocouple Wiring Guidelines

- The thermocouples are type “J” grounded and are color coded to ASA standards. (White “+”/Red “- “).
- The tip must not be cut or crimped, and must touch the bottom of the bore in order to measure the correct temperature.
- Each heat source should have its own closed loop temperature control in order to achieve accurate control.
- If there are not enough control zones, heat sources that have the same wattage and effect the same environment, may be grouped together.

Heating Test with a Temperature Controller

- Never start the heating with more than 40% of power.
- Stay a minimum of 5 minutes at 212°F (100°C) before increasing heat.
- Stay with the system and monitor the initial heating to minimize risk.

Section 7 - System Installation

Introduction

The following section is a step-by-step guide to install your *Mold-Masters* Vision hot runner into the existing manifold plate system or spacer block system.

Prior to Assembly

1. Please unpack and clean the system as outlined in ***Section 4 - Preparation.***

WARNING
Make sure the lifting eyebolt, lifting chain and crane are rated to adequately support the weight of the plate(s). Failure to do so can cause a serious injury.

Make sure the machine has been locked out and tagged out in accordance to the machines documented procedures. Failure to do so may lead to serious injury or death.

CAUTION
Do not assemble/disassemble cavity plate with the valve pins forward.
Valve pins must be retracted prior to cavity plate installation.
Potential pinch point. Ensure that all wires are retained.

NOTE
Refer to the general assembly (GA) drawings for instructions.

System installation

Water Cooling Nozzle Jacket Assembly

(Please note: your system may not include the water cooling nozzle jacket option. Refer to your general assembly drawing for details):

1. Clean the insert-seating bore.
2. Install O-rings onto the water cooling nozzle jacket.
3. Insert water cooling nozzle jacket assembly into seating bore.
4. Fasten the water cooling nozzle jacket to the mold plate with the supplied button head cap screw and washer.

Install Sub-manifold Assembly

CAUTION
Match drop #'s stamped on wedge and bridge during assembly.

1. Measure and confirm height as specified on GA drawing.
2. Insert nozzle into seating bore (or water cooling nozzle jacket) ensuring that the anti-rotation dowel is engaged in the slot.
3. Take care not to pinch the wires.
4. Remove any installation tools used.
5. Apply anti-seize to the four system screws and install.
6. Torque system screws in a crossing pattern gradually increasing torque to specified value.
7. Measure and confirm wedge height as specified on GA drawing.
8. Repeat for each drop.

Install Manifold Locator and Anti-Rotation Dowel

NOTE
Check GA drawing for information for your system.

1. For some systems, locators are supplied oversize and must be ground to the same level as the top of the nozzles. Remove the material from the bottom face of the locator (FACE Y). **However, check the GA drawing for exception notations.**

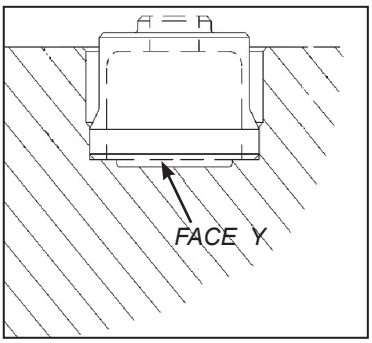

Figure 7-1 Locator Surface

2. Using a depth micrometer, verify the dimensions of the manifold pocket to those specified on the print.

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3. Blue the manifold locator into the bore to ensure proper seating.
4. Install the anti-rotation dowel into the mold. Ensure sufficient gap between the dowel and the manifold slot top surface. Under no circumstances should they touch.

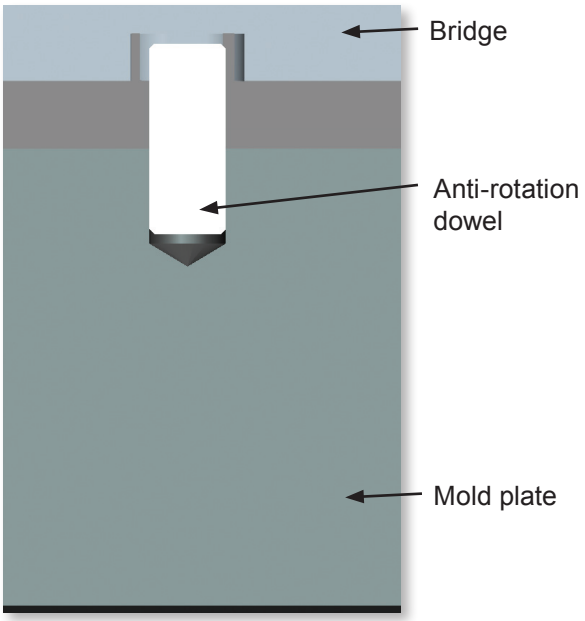

Figure 7-2

Install Bridge Assembly

CAUTION
Match drop #'s stamped on wedge and bridge during assembly.

NOTE
Bridge mounting screws should be torqued 1/3 higher than specified on GA drawings.

1. Measure and confirm locator height as specified on GA drawing.
2. Align bridge to sub-manifold wedges and locate on manifold locator.
3. Take care not to pinch the wires.
4. Remove any installation tools used.
5. Apply anti-seize to the bridge screws.
6. Torque bridge screws in a crossing pattern gradually increasing torque to specified value.
7. Measure and confirm drop height as specified on GA drawing.
8. Repeat for each drop.

Final Installation Steps

1. Connect the sub-manifold power wires to the bridge using quick connectors, if applicable. Ensure quick connectors are locked as shown below.
2. Connect all the plumbing (air and water hoses) to the sub-manifold unit.
3. Install SHCS to secure electrical and solenoid interface to exterior of mold base.
4. Install clamp plate.

Section 8 - System Start Up & Shut Down

Pre-Start-up

1. Install the mold into the molding machine.

NOTE
Ensure the machine nozzle orifice matches or at most is 1.0 mm (0.040”) smaller than melt entrance for the hot runner system.

2. Connect all water lines and test. Water temperature is not to exceed 85° F. Water to Valve Actuators must be turned on before heating is activated.
3. Connect all hydraulic / pneumatic lines (if applicable).

CAUTION
Check that the system is heated to processing temperature. Failure to do so could cause damage to the valve pins. Water must be turned on for Vision actuation before turning on temperature controls. Actuator water temperature cannot exceed 85° F (29.4°C).

4. Test the pin actuation, only once the hot runner is at processing temperature.
5. Connect all electrical components.

Start-up

WARNING
Assume the system is pressurized and hot at all times. Failure to do so can result in a serious injury or death.

NOTE
When running thermally sensitive materials, use a thermally stable material as recommended by the material supplier for the initial start-up.

1. Turn ON the machine barrel and mold cooling system.
2. Prior to start-up, ensure the:
   - Vision Valve Gate Actuator water is on.
   - Maximum inlet water temperature does not exceed 85° F (29.4°C).
   - Machine barrel is up to processing temperature.
   - Mold cooling is on and at cooling temperature.
3. Heat up the hot runner system to processing temperature. Wait until ALL heating zones reach processing temperature before continuing.

WARNING
When the mold is open never inject material through hot runner system under high pressure. This can result in serious injury or death.

4. Start-up (only for empty hot runner system). Extrude material through the hot runner system using 200 PSI (14 bar) of back pressure.
5. Start-up (for systems filled with material). Purge intended shot size twice from the barrel prior to bringing the machine barrel forward to the hot runner interface.
6. Set injection time and pressure in coordination to part size, gate size and material.

NOTE
For hot runner systems using heater plates, allow 20 minutes of soak time after the system reaches processing temperature.

CAUTION
Failure to follow the above procedure may result in leakage/damage occurring in the hot
runner.

Shut Down

1. Turn OFF all heat to the system.
2. Leave the mold cooling system ON, including valve actuator water, until the hot runner system temperature is within 100°F (37.7°C) of the mold temperature.

NOTE
Thermally sensitive materials should be purged from the hot runner system prior to shut down using a thermally stable material with a similar processing temperature. For example, a system running PVC should be initially started and subsequently shut down on LDPE.

Section 9 - Maintenance Procedures

Introduction

This chapter is a guide to maintaining selective components.
Repairs that should be performed by *Mold-Masters* personnel are not included. If you need an item repaired that is not included in this section, please call *Mold-Masters* support.

Terminal End Removal

1. If the terminal end is covered with plastic, warm the terminal end prior to removing the element sleeve.

   CAUTION
   Care must be taken when removing the element sleeve to not damage the ceramic sleeve or terminal nut.

2. Grip the element sleeve at the threaded area and turn counter clockwise. If the wires rotate with the sleeve, damage may result.
3. Remove the seal.
4. Remove the set screw from the ceramic sleeve.
5. Remove the power leads.

   NOTE
   Please contact Mold-Masters Spare Parts Department (1-800-387-2483) to ensure you have the correct repair kit and crimping tools. Available tools, along with the lead wire replacement kit, are shown below.

Terminal Assembly

1. Assemble the repair kit components.
2. Ensure the terminal end is clean.
3. Slide the element sleeve, silicon seal and ceramic insulator onto the wires.
4. Slide crimps onto leads. Stranded wire should extend beyond the crimp.
5. Spread the wire strands and insert the lead wire onto the terminal posts.
6. Grasp the crimp with the crimping tool, slide the crimp into position over the terminal post and crimp the connection.
7. Slide the ceramic insulator and silicon seal into place.
8. Complete the repair by screwing the element sleeve into position.

   CAUTION
   Keep an eye on the silicon seal. It should not rotate with the sleeve or the wires may break.

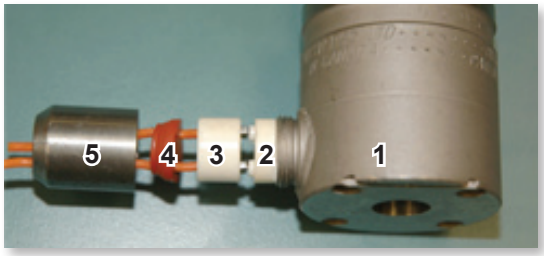

Figure 12-1 Nozzle Terminal Assembly
1. Nozzle Flange 2. Ceramic Insert
3. Ceramic Sleeve 4. Seal 5. Element Sleeve

Crimping Tool Chart

Product Name	Description
PUNCHHANDLE01	Ratchet Crimp, tool for attaching dies to terminal end assemblies
CRIMPDIE01	4.0mm Heater Element (Mates with CRIMPPUNCH01)
CRIMPPUNCH01	4.0mm Heater Element (Mates with CRIMPDIE01)
CRIMPDIE02	2.5 - 3.0mm Heater Element (Mates with CRIMPPUNCH02)
CRIMPPUNCH02	2.5 - 3.0mm Heater Element (Mates with CRIMPDIE02)
CRIMPDIE03	1.8 - 2.0mm Heater Element (Mates with CRIMPPUNCH03)
CRIMPPUNCH03	1.8 - 2.0mm Heater Element (Mates with CRIMPDIE03)
CRIMPREMOVEB01	Bottom Crimp Removal Insert for shearing HE crimps (Mates with CRIMPREMOVET01)
CRIMPREMOVET01	Top Crimp Removal Insert for shearing HE crimps (Mates with CRIMPREMOVEB01)

Heater Plate Power Lead Replacement

Removal

1. Remove the set screws.
2. Slide ceramic sleeve off.
3. Remove the power leads using crimp removal tool.

Installation

1. Push the replacement leads into the holes in the ceramic sleeve.
2. Crimp the leads to the terminal ends.
3. Slide ceramic sleeve over the terminal end.
4. Tighten the set screws on the ceramic sleeve to secure the terminal assembly.

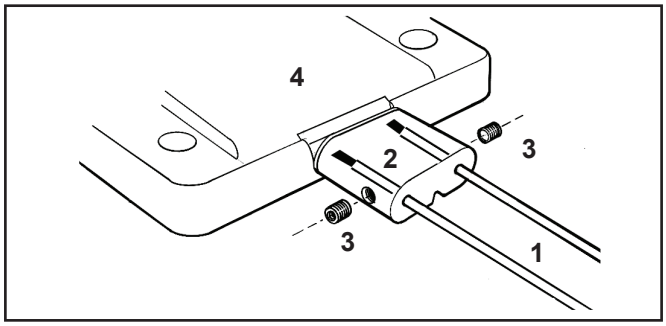

Figure 12-2 Terminal Ends Assembly
1. Power Leads 2. Ceramic Sleeve
3. Set Screws 4. Heater Plate

Gate Seal Maintenance

Reasons for Gate Seal Maintenance

- Tip damage
- Obstruction to melt flow
- Gate seal damage
- Tip wear

Multi-Cavity Systems

It is advisable to heat the system to ensure the temperature condition is met to remove the gate seals.

NOTE
Use the socket supplied in the *Mold-Masters* tool kit to loosen the gate seal.

It is recommended to use a temperature controller for this procedure. If a temperature controller is not available, contact your nearest *Mold-Masters* Service Department. For gate seal installation and torquing procedures refer to "*Gate Seal Replacement*" section.

Gate Seal Removal

The following procedure applies to all gate seals (including carbide) with threads larger than an M6.

Figure 12-3

NOTE
If the cavity plate is easily removed you can access the nozzle seals while still in the system.
Hot runner systems must be within 70°F (40°C) of mold temperature before the cavity plate can be removed. It is recommended the nozzle be removed from the system before removing the gate seal.
Use the socket supplied in the *Mold-Masters* tool kit to loosen the gate seal.

1. Apply penetrating lubricant to gate seal area.

Figure 12-4

WARNING
High temperature on the nozzle. Wear safety clothing such as heat-resistant coat and heat-resistant gloves. Failure to do so may cause serious injury.

CAUTION
The terminal end is a sensitive area and can easily break if not handled to specifications.

2. Leave the nozzle in the mold or remove it to a vice and clamp carefully.
3. Using the temperature controller, heat the nozzle body until all residual plastic is melted from the gate area. If the nozzle is inside the mold, heat up the whole system and turn on the cooling or remove all O-rings.
4. While the nozzle is still hot, apply a loosening pressure to the gate using the socket to remove the seal.
5. Turn off the controller and wait for 5 minutes.
6. Remove the gate seals.

Figure 12-5

Gate Seal Replacement

1. Clean the nozzle, especially the thread and runner.
2. Clean all residual plastic from the threads and counter bore of the gate seal.

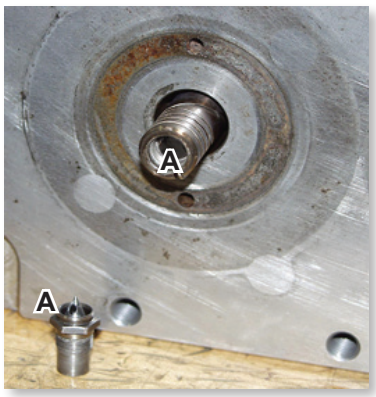

Figure 12-6 Cleaning Locations
(A) Remove Plastic

WARNING
Ensure nozzles have cooled to room temperature. Failure to do so may cause serious injury.

CAUTION
It is critical that seal surface is perfectly clean. Failure to clean properly may result in nozzle and seal damage and leakage.

3. Check the bottom face of the nozzle counterbore for damage. If damaged, lap the bottom face of the nozzle in a circular fashion with a hardened tool and 300 grit lapping compound. If the nozzle counterbore is free of damage, proceed to step 5.

Figure 12-7

4. After lapping is complete, blue the liner to the nozzle to ensure proper mating. If the liner is making good contact, clean the bluing compound off both faces.

Figure 12-8

5. Apply anti-seize (nickel based) to the gate seal threads ONLY.

Figure 12-9

CAUTION
Carefully apply anti-seize to threads of the gate seal. Any anti-seize that enters the internal runner must be removed to prevent contamination of melt.

6. Using a socket wrench, re-install the gate seal being careful not to damage it.
7. Torque the gate seal to the appropriate value. Refer to "*Gate Seal Torque Settings*".

WARNING
High temperature on the nozzle. Wear safety clothing such as heat-resistant coat and heat-resistant gloves. Failure to do so may cause serious injury.

8. Check that the seal has bottomed out, heat nozzle to process temperature and re-torque seal.

WARNING
Failure to torque the gate seals at processing temperatures may result in leakage.

Checking Nozzle Tip Height

1. Correct nozzle tip height and nozzle reference point is found on the gate detail of General Assembly Drawing.
2. Assemble spacer blocks to same value as correct nozzle tip height.
3. Zero vernier to spacer blocks.

Figure 12-10

4. Move vernier to correct reference point on nozzle tip (per drawing).

Figure 12-11

5. Check that nozzle height is within drawing specification.
6. Repeat for each nozzle.

Replacing Pneumatic Cylinder Seal and Gasket

1. Use snap retaining tool to remove retainer ring.
2. Slowly pull out the piston.
3. Remove any damaged seals and/or gasket.
4. Carefully install the new seals or gasket into the piston and/or collar.
5. Apply lubricating grease when needed.
6. Install piston and collar back into the cylinder tube.
7. Use retaining ring pliers to install the retaining ring, making sure it is seated properly.

Figure 12-12 Pneumatic Cylinder Components

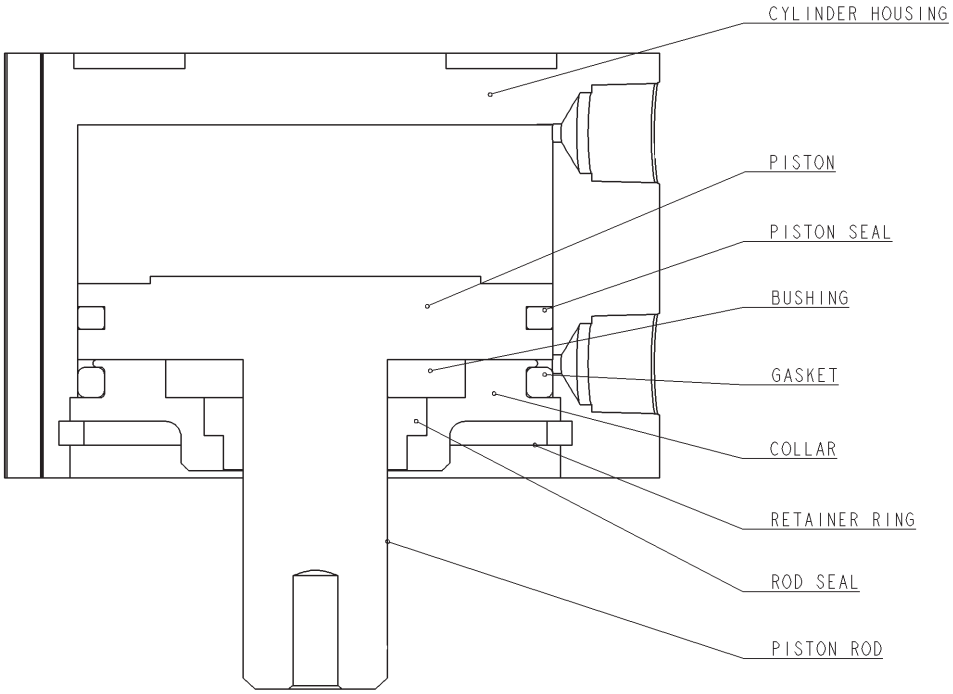

Figure 12-13 Pneumatic Cylinder Section

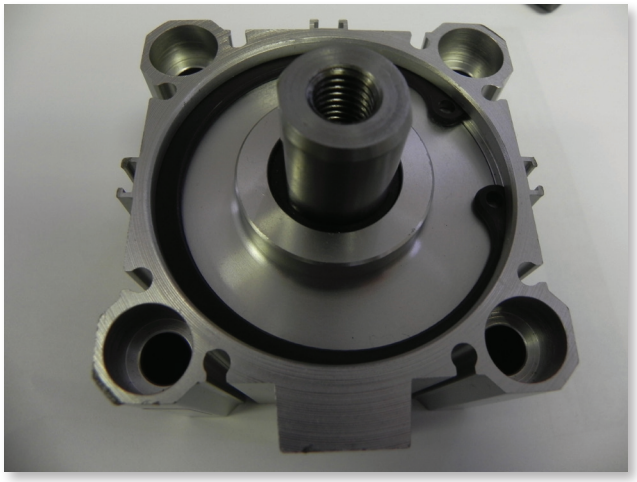

Figure 12-14 Pneumatic Cylinder Assembled

Nozzle Thermocouple Removal

NOTE
Removing thermocouples will damage them and is not recommended unless replacing a damaged thermocouple with a replacement one.

1. Remove the thermocouple from the electrical box and wire channels.
2. Remove the nozzle from the manifold plate.
3. Remove the thermocouple retaining clips.
4. Remove the thermocouple.

Torque Settings

Gate Seal Torque Settings

Gating Method	Hecto		
	ft-lb	Nm	ft-lb
Bi-Metallic C-Valve	25-28	47-54	35-40
Bi-Metallic Extended C-Valve	25-28	47-54	35-40

NOTE
Gate seals are torqued at ambient (room) temperature at *Mold-Masters*. Please torque each seal at processing temperature to the torque value specified. This is to prevent material leakage from the gate seal.

System Screw Torques

Quality and length of screws must be as specified on *Mold-Masters* general assembly drawings.

Torque Chart for System Assembly Screws			
Metric	Torque Setting	Imperial	Torque Setting
M5	7 Nm	#10-32	5 ft lbs
M6	14 Nm	1/4-20	10 ft lbs
M8	20 Nm	5/16-18	15 ft lbs
M10	40 Nm	3/8-16	30 ft lbs
M12	60 Nm	1/2-13	45 ft lbs
M16	145 Nm	5/8-11	107 ft lbs
M20	285 Nm	3/4-10	210 ft lbs

Exception to the above, bridge manifold mounting screws should be torqued 1/3 higher then specified on general assembly drawings.

Torque Chart for Plate Assembly Screws			
Metric	Torque Setting	Imperial	Torque Setting
M5	10 Nm / 7 ft lbs	#10-32	9 Nm / 6 ft lbs
M6	16 Nm / 12 ft lbs	1/4-20	22 Nm / 16 ft lbs
M8	39 Nm / 29 ft lbs	5/16-18	48 Nm / 35 ft lbs
M10	77 Nm / 57 ft lbs	3/8-16	85 Nm / 63 ft lbs
M12	135 Nm / 100 ft lbs	1/2-13	209 Nm / 154 ft lbs
M16	330 Nm / 243 ft lbs	5/8-11	384 Nm / 283 ft lbs
M20	650 Nm / 479 ft lbs	3/4-10	678 Nm / 500 ft lbs

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Section 10 - Troubleshooting

Introduction

This troubleshooting information assumes that the hot runner has been operational.

Basic rules for troubleshooting are:

- Define the problem; what is seen is only a symptom of the underlying problem.
- Develop a method to isolate the problem.
- Test one item at a time to verify results.
- Monitor the final solution to verify that the problem has been solved. Repeat occurrences of the same symptom may indicate other problems.
- Document the solution so that a repeat occurrence can be solved quickly.
- Consult other resources to augment the troubleshooting information in this manual. One of the best resources may be your resin supplier.

NOTE
Refer back to **Section 3: Safety** for proper procedures to be followed.

WARNING
Extreme heat. Avoid contact with heated surfaces. To avoid serious burns wear safety clothing consisting of a protective heat resistant coat and heat-resistant gloves. Use adequate ventilation for fumes. Failure to do so can result in a serious injury.

Make sure the machine has been locked out and tagged out in accordance to the machines documented procedures. Failure to do so may lead to serious injury or death.

Moisture Related Issues

Many common molding issues can be directly attributed to moisture contamination of the production resin.

Generally, manufacturing resin is supplied from the manufacturer in ready to process pellets that are in sealed, airtight containers. Follow manufacturers storage instructions, keeping containers sealed until ready to use.

Prior to using pellets, follow the drying instructions, as provided by the resin supplier and molding machine manufacturer (if applicable).

Resin Moisture Contamination

Moisture can be introduced into the resin in many ways:

- during transportation
- environmental exposure (aging)
- malfunctioning heater/dryer
- extreme humidity in atmosphere
- inadequate or malfunctioning facility HVAC

Resin Drying Issues

During the drying stage of the resin (if applicable), ensure that:

- the resin pellets are not overpacked
- adequate air circulation is present
- the drying system is properly sealed, according to manufacturers instructions

Importance of Pre-Drying Resin

Thermoplastic resins can be hygroscopic, able to absorb moisture from the air. Under normal processing conditions, this can lead to degradation of the polymer during molding. Breakage of polymer chains changes the properties, resulting in possible blisters, streaks, splay or other defects described in this section.

Recycled resins can have higher hygroscopic properties due to greater surface area and should be dried separately from fresh resins.

If moisture issues are ruled out, continue with the troubleshooting tables in the following pages.

Pre-Molding Precautions

Prior to commencing production, ensure that the following conditions have been met. This will greatly reduce any future need to troubleshoot defective production.

History

Review any documentation associated with your batch job regarding the recipe using the mold, molding machine, thermoplastic resin, environmental setting, etc.
Review comments, notes, logbooks, blogs, and anything other resource material that pertains to the batch job.
Verify that all settings such as all time, temperature, pressure, material, etc are correct.

Material

Ensure that the thermoplastic resin to be used is the right grade, and has been stored and/or prepared/dried, etc, according to manufacturers specs.
Verify that the pigment/dye to be used meets manufacturers specifications, and is compatible with the resin/molding machine/mold.
Verify the correct recycle ratio and adjust settings accordingly.

Hardware

Make sure the mold has been properly stored, and is dry, clean, free of rust, dirt, moisture, residual resin, pigment and any protective coating.
Check that the temperature controller meets requirements, and is fully tested and operational.
The injection molding machine has been properly maintained, cleaned, lubricated; tolerances and dimensions verified.
Make sure that the nozzles, cylinders, valves, gates, and any other variable that is appropriate for the batch job has been chosen.

Settings

Ensure that all batch job parameters are correct:

- Temperatures
- Pressures
- Injection Speed
- Back Pressure

Establishing Root Cause

This section is to be used as a reference tool only.

When a system that has been set up according to specification and was functioning normally suddenly produces sub-standard parts, the data in the following pages may be used to determine the possible cause, but only should be used as a guide.

A correct set up procedure that has been proven in will produce parts that meet design tolerances and specifications. A sudden change in any parameter indicates a possible fault. Rather than modify other settings to compensate for this variation, it is advisable to determine which of the original settings has changed.

Fault Identification

The operator will need to evaluate all the possible conditions which may have caused the defect.

- Identify the problem
- Determine the frequency
- Is the problem random or in the same location
- Review past history logs for similar occurrences and resolutions.

Review the machine settings to ensure that there is no variation from the original set-up which was producing standard parts.

injection speed	melt heating
screw speed	locking
melt temperature	cushion
back pressure	mold heating

For a more thorough analysis of the defect, refer to the **Troubleshooting Section** in the following pages.

Defect types, causes and remedies index

Parts have dark specks	Page 10-4
Parts have blisters and/or bubbles	Page 10-5
Parts have burn marks	Page 10-6
Parts surface has jetting	Page 10-7
Parts are short	Page 10-8
Parts have sink marks or voids	Page 10-9
Parts display splay	Page 10-10
Parts are streaked	Page 10-11

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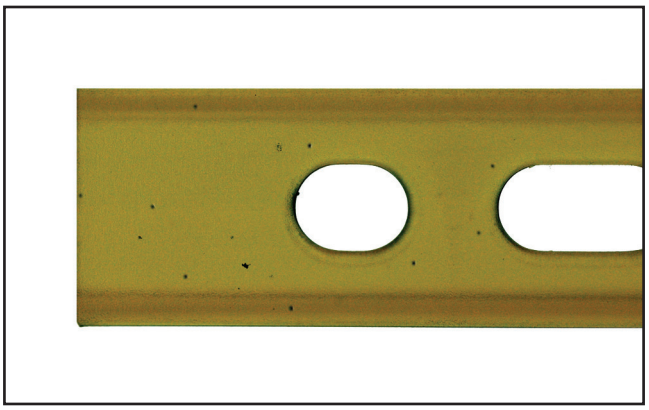
Parts have dark specks

The finished product contains dark particles.
(When transparent resins are usually used.)



Probable Cause:

Molding Machine

- Off line for extended period
- Barrel offline for extended period
- Barrel improperly purged
- Contamination in plasticizer
- Wrong nozzle
- Use of wrong screw

Mold

- Gate and/or runner has dead spots

Material

- Physical contamination of raw material
- Chemical contamination of raw material
- Particulate contamination from machine barrel

Solution (In sequence):

- Purge system with appropriate material
- Trace source of contamination and repair, remove or discard
- Adjust melt temperature if necessary
- Inspect for dead spots: gates; runners; nozzle; back flow valve
- Inspect feed screw for degradation

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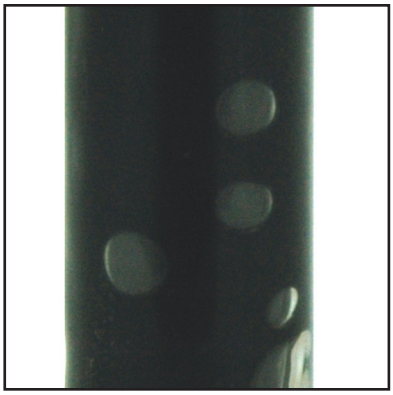
Parts have blisters and/or bubbles

The finished product contains small gas or air filled pockets or cooling voids.



Probable Cause:

Molding Machine

- Low Injection Pressure
- Back flow valve malfunctioning
- Suck-back cycle too long
- Rapid plasticizing
- Trapped air in feed
- Feed error

Mold

- Trapped or volatile gas
- Low mold temperature
- Poor thin/thick transition phase
- Inadequate venting

Material

- Overheating of resin

Solution: (In sequence)

- Verify control and/or holding pressure
- Increase back pressure
- Increase mold temperature
- Inspect back flow valve
- Ensure proper venting
- Increase gate size
- Decrease vent land length

Parts have burn marks

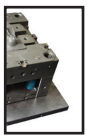
The finished product display brown streaks. This is from the material being overheated due to trapped air (diesel effect), which can lighten or darken the color.

Probable Cause:

Molding Machine

- High injection speed
- Backflow/check ring valve malfunctioning
- High back pressure

Mold



- Trapped or volatile gas
- Burning due to friction
- Incorrect sprue diameter

Material

- Overheated/underheated melt, possible shear

Solution: (In sequence)

- Clear blocked vent channels
- Lower injection speed
- Lower injection pressure
- Check heater functionality
- Check thermocouple functionality
- Reduce feed screw rotation
- Reduce melt temperature
- Increase mold cavity venting
- Enlarge gate
- Change gate position and/or size

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Parts surface has jetting

The finished product exhibits serpentine flow patterns on the surface as a result of the melt cooling prior to complete filling of the mold.

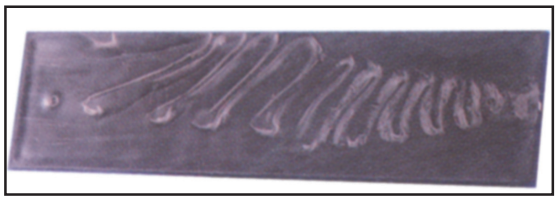
Probable Cause:

Molding Machine

- High injection speed

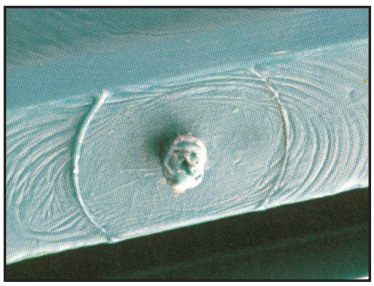
Mold

- Cold mold
- Small gate
- Wrong gate land length
- Wrong gate location



Material

- Cold melt

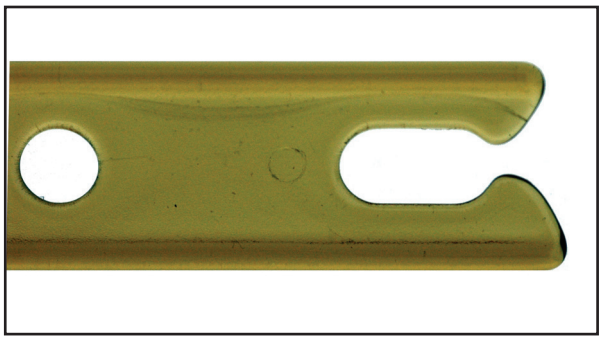


Solution (In sequence):

- Decrease injection speed
- Verify nozzle temperature
- Increase mold temperature
- Increase melt temperature
- Increase gate size
- Modify gate location

Parts are short

The finished product is not completely formed.



Probable Cause:

Molding Machine

- Bad feed
- Low injection pressure
- Low injection speed
- Short injection time
- Back flow valve / check ring faulty
- Improper venting

Mold

- Insufficient venting
- Cold mold

Material

- Low melt temperature
- Viscous material

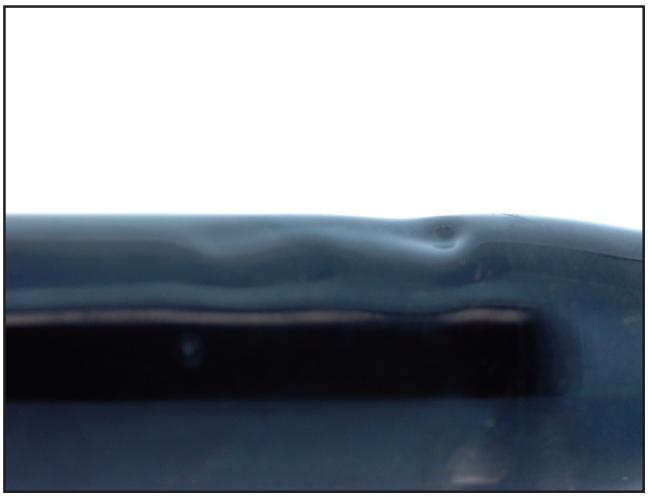
Solution (In sequence):

- Increase feed
- Increase injection pressure
- Increase feed temperature by increasing cylinder temperature
- Increase injection time
- Increase mold temperature
- Increase nozzle diameter
- Inspect for restrictions
- Increase gate size of sprue and runner system

Parts have sinks or voids

The finished product has hollows and pockets in areas that do not cool sufficiently, causing contraction.

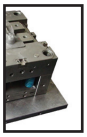
Probable Cause:



Molding Machine

- Low injection pressure
- Short injection time
- Insufficient material in cavity
- High injection speed
- Low back pressure
- Damaged backflow valve / check ring

Mold



- Mold not at required temperature
- Small gate leading to early freezing
- Gate land length too long
- Incorrect rib/wall dimensions
- Material flow incorrect
- Thick wall part

Material

- Hot material
- Material wrong grade for application

Solution: (In sequence)

- Adjust injection speed
- Increase injection hold time
- Increase injection pressure
- Adjust melt temperature
- Adjust mold temperature
- Inspect for hot spots
- Enlarge and/or add vents to mold parting line
- Increase sprue or runner size
- Increase gate size/reduce gate land length
- Relocate gate closer to heavy/thicker areas
- If possible, core out heavy wall sections

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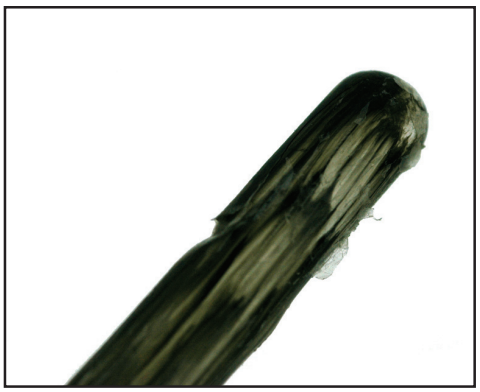
Parts display splay

The finished product display splay/splash marks and/or silver streaks.

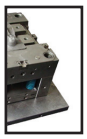


Probable Cause:

Molding Machine

- Resin degraded from overheating
- Cylinder contains hot spots
- Material trapped at nozzle tip
- Wrong injection pressure
- Wrong injection speed
- Low back pressure

Mold



- Friction related burning in gate, nozzle or hot runner
- Trapped volatile compounds

Material

- Hot melt
- Contaminated resin (moisture, dirt, organics)
- Degraded resin

Solution (In sequence):

- Dry resin according to procedure; check drying equipment for functionality
- Reduce nozzle temperature
- Reduce material temperature:
  1. lower cylinder temperature; 2. reduce screw speed; 3. reduce back pressure
- Decrease injection speed
- Increase mold temperature
- Decrease or eliminate screw decompression
- Reduce cycle time
- Check for drooling
- Check for contamination in mold cavity
- Open gates
- Try mold in smaller shot-size press

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Parts are streaked

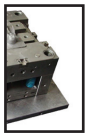
The finished product has large, dull and laminate appearance areas on the surface.

Probable Cause:

Molding Machine

- Back flow valve ring damaged

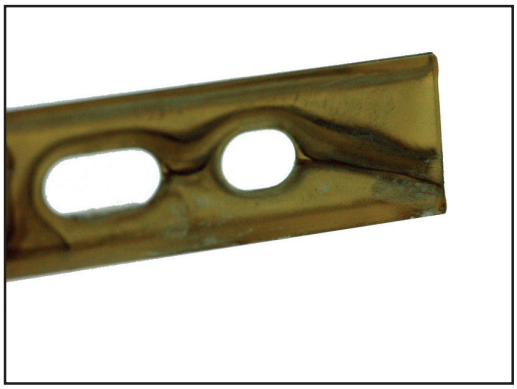
Mold



- Hot spots
- Material trapped in certain areas

Material

- Contamination of resin or machine
- If pattern is identical, cause may be the machine
- If pattern is erratic, cause may be the material or coloring
- Degraded or unstable material



Solution: (In sequence)

- Check for contamination
- Check barrel purging
- Inspect back flow ring for wear or cracks
- Inspect feed screw for wear and tear
- Inspect screw/barrel for tolerances
- Verify heater operation
- Verify thermocouple operation

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